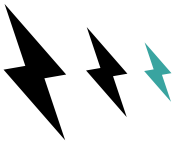
Climate Change and Resilience: Improving the Long-term Sustainability of the U.S. Transportation System

U.S. Department of Transportation
Volpe Center

Global transportation infrastructure today is confronted with the escalating threat of climate change. The U.S. Department of Transportation (U.S. DOT) is taking steps to reduce greenhouse gas emissions, build a more sustainable and resilient transportation system, and respond to the disruptive impacts of climate change.

- The U.S. DOT Volpe National Transportation Systems Center (Volpe Center) has worked at the intersection of climate change and transportation since it first opened its doors in 1970.
- The U.S. DOT Volpe Center's multidisciplinary, multimodal team of experts work together to improve the long-term sustainability of the national and global transportation systems.
- Through its vibrant communities of practice, the U.S. DOT Volpe Center regularly brings together staff from across disciplines and teams to share knowledge, exchange experience, and discuss best practices on a variety of skills and topics, including climate change and resiliency.

U.S. DOT Volpe Center Climate Change and Resilience Expertise



Improving Efficiency and Reducing Emissions from Transportation

- Vehicle fuel efficiency, emissions modeling, and technology adoption projections
- Facility energy modeling and emissions reduction
- Lifecycle, operational, organizational, societal, and facility-level carbon accounting
- Diversified energy/fuel sources analyses, including electric and zero emissions vehicles
- Emissions management, trading, and policy analyses

Assessing Infrastructure Vulnerability and Promoting Resilience

- Vulnerability/risk assessments at multiple scales and for various types of assets and climate stressors
- Integration of disruption planning, resilience, and climate adaptation into long-range transportation planning
- Freight and energy scenario planning modeling and analyses for understanding and communicating future transportation needs, patterns, and impacts
- Economics of transportation disruption impacts, mitigation, and adaptation
- Cybersecurity analyses, impact assessments, and mitigation
- Infrastructure resource capacity assessments given a climate driven migration (i.e., forced migration)

Planning and Implementing Sustainable Transportation Systems

- Implementation of sustainability initiatives, performance/program review, and reporting
- Interagency partnership and stakeholder coordination to promote action, even in disaster response and recovery
- Development of sustainability and climate change impact assessment tools
- Enhancement of organizations' abilities to evaluate, plan for, and implement resilience strategies
- Capacity building for individuals and organizations to shift to low carbon transportation options and solve resilience-related challenges

Our Partners in Climate Change and Resilience

- U.S. Department of Agriculture
  - U.S. Forest Service
- U.S. Department of Defense
  - U.S. Air Force
  - U.S. Navy
- U.S. Department of Energy
  - Advanced Research Projects Agency—Energy
- U.S. Department of the Interior
  - Bureau of Land Management
  - National Park Service
  - U.S. Fish and Wildlife Service
- U.S. Department of Transportation
  - Assistant Secretary for Aviation and International Affairs
  - Federal Aviation Administration
  - Federal Highway Administration
  - Federal Motor Carrier Safety Administration
  - Federal Railroad Administration
  - Federal Transit Administration
  - Maritime Administration
  - National Highway Traffic Safety Administration
  - Office of the Secretary of Transportation-Policy
  - Office of the Secretary of Transportation-Research
- Millennium Challenge Corporation
- Other Key Partners
  - Cambridge Department of Public Works
  - Global Resilience Institute (Northeastern University)
  - Massachusetts Department of Transportation
  - New York City Department of Citywide Administrative Services

Recent U.S. DOT Volpe Center Climate Change and Resilience Work

Improving Efficiency and Reducing Emissions from Transportation

AVIATION

- Aviation Environmental Design Tool
- Achieving Airport Carbon Neutrality
- U.S. Airport Greenhouse Gas Emissions Inventories: State of the Practice and Recommendations for Airports
- Commercial Aviation Alternative Fuels Initiative (CAAFI®)
- ICAO Environmental Trends
- ICAO Environment Report 2013: Aviation and Climate Change
- ICAO Environmental Report 2019: Environmental Trends in Aviation to 2050
- ICAO Environmental Report 2022: Environmental Trends in Aviation to 2050

RAIL

- Best Practices and Strategies for Improving Rail Energy Efficiency

FREIGHT

- Bunker Adjustment Factor, Fuel Adjustment Factor, and Currency Adjustment Factor Study

TRANSIT

- FTA's Greenhouse Gas Emissions Estimator 3.0
- FTA Transit Bus Electrification Tool
- FTA Greenhouse Gas Emissions from Transit Projects: Programmatic Assessment

HIGHWAYS

- Cambridge Clean Fleet Initiative: 2030 GHG Reduction Scenarios and Proposed Target
- Carbon Sequestration Pilot Program
- Corporate Average Fuel Economy (CAFE)
- CAFE Compliance and Effects Modeling System: The Volpe Model
- Reducing Heavy Truck Fuel Consumption
- Renewable Energy in Highway Right-of-Way
- Highway Renewable Energy: Photovoltaic Noise Barriers
- Fleet Decarbonization Target and Strategy Optimization
- FHWA CMAQ Emissions Calculator Toolkit
- Reducing Heavy Truck Fuel Consumption

MULTIMODAL

- Carbon Dioxide Emissions from Four Real World Inter-City Passenger Trips: A Comparison of Rail, Air, and Road Travel Modes by City Pair
- Confluence of ITS, Complete Streets, and GHG Emissions
- Report to Congress on Transportation Decarbonization

Assessing Infrastructure Vulnerability and Promoting Resilience

- Vulnerability Assessment of the Transportation Infrastructure Relying on the Global Positioning System
- Airport Resiliency
- FAA Sustainable and Resilient Remediation (SRR)
- Scenario Planning for Resiliency and Emissions Reduction in Massachusetts and New Mexico
- Freight and Fuel Transportation Optimization Tool (FTOT)
- OST EREP Climate Hazard Exposure and Risk (CHER) Tool
- PROTECT Discretionary Grant Program
- FHWA Vulnerability Assessment and Adaptation Framework, 3rd Edition
- Hampton Roads Climate Impact Quantification Initiative
- Transportation Energy Resilience Toolkit

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- U.S. Forest Service Transportation Resiliency Guidebook: Addressing Climate Change Impacts on U.S. Forest Service Transportation Assets
- Climate Change Adaptation Support for Transportation Practitioners
- Beyond Bouncing Back: A Roundtable on Critical Transportation Infrastructure Resilience
- Resilience and Disaster Recovery (RDR) Tool Suite
- U.S.-Netherlands Infrastructure Resilience Collaboration
- Trails and Resilience: Review of the Role of Trails in Climate Resilience and Emergency Response
- Infrastructure Resiliency: A Risk-Based Framework

Planning and Implementing Sustainable Transportation Systems

- Addressing Transportation's Impact: A Starter Guide to Reducing Transportation Greenhouse Gas Emissions
- Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects
- Connecting Transportation Planning and the Environment
- Global Approaches to Addressing Biofuel-related Invasive Species Risks and Incorporation into U.S. Laws and Policies
- INVEST (FHWA Infrastructure Voluntary Evaluation Sustainability Tool)
- Sustainable Rest Area Design and Operations
- EERPAT: Strategic Planning for GHG Emissions at Statewide Areas
- VisionEval: Open-Source Strategic Planning Model Framework
- Building Resilient Infrastructure: How to Create Strong and Adaptable Transportation Systems
- Carbon Reduction Program
- Charging Forward: A Toolkit for Planning and Funding Rural Electric Mobility Infrastructure
- Charging Forward: A Toolkit for Planning and Funding Urban Electric Mobility Infrastructure
- Multifamily Housing Charging Study
- North Cascades Long-Term Access and Resilience Strategy
- NYC Clean Fleet Transition Plan
- U.S. National Blueprint for Transportation Decarbonization and Sectoral Action Plans
- Technical and Programmatic Support for FHWA's Alternative Fuel Corridor Designation Program
- Technical and Programmatic Support for the Joint Office of Energy & Transportation
- Technical and Programmatic Support for the U.S. Dept. of Energy's Vehicle Technologies Office and Technology Integration/Clean Cities Program

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